PROJECT REPORT

PROJECT TITLE: Smart Waste Management System For Metropolitician Cities

TEAM ID : PNT2022TMID14224

TEAM MEMBERS :

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1.INTRODUCTION

1.1 OBJECTIVES

The main objective of this system includes

1.2 SYSTEM OVERVIEW

Our waste generation is constantly growing to form a global garbage crisis. Even though we indulge in creating a more sustainable and greener, we still fail to handle our waste generation and management. Combining technology support with a vision of social, economic and environmental sustainability is the best way out of this problem. It is done in the following manner. The smart bin system undergoes a thorough system check and battery level monitoring in order to function efficiently. If the battery level is found to be low, it has to be recharged immediately, else it can proceed to the next step. The threshold level levels of the bin are indicated my multiple sensors attached to bin. If the garbage exceeds the level, then an alert message is sent to the garbage collectors as well as to the municipality or area administration.

1.3 ORGANIZATION OF REPORT

Chapter 1 gives the objectives, system overview.

Chapter 2 summarizes the review of related background to the semiautomated wiper system.

Chapter 3 outlines the system implementation including problem statement, overview of components usage proposed methodology.

Chapter 4 deliberates the results of the proposed system and gives inference about the results. Chapter 5 discusses the conclusion and future outlooks.

2. LITERATURE REVIEW

2.1 EXISTING PROBLEM

Waste management has become an alarming challenge in local towns and cities across the world. Often the local area bins are overflowing and the municipalities are not aware of it. This affects the residents of that particular area in numerous ways starting from bad odour to unhygienic and unsafe surroundings. Poor waste management - ranging from non-existing collection systems to ineffective disposal -causes air pollution, water and soil contamination. Open and unsanitary areas contribute to contamination of drinking water and can cause infection and transmit diseases. Toxic components such as Persistent Organic Pollutants (POPs) pose particularly significant risks to human health and the environment as they accumulate through the food chain. Animals eating contaminated plants have higher doses of contaminants than if they were directly exposed.

2.2 RELATED BACKGROUNDS

The given below literature covers a wide variety of inventions, this review will focus on four major themes which emerge repeatedly throughout the literature reviewed.

T. K. Leong (2011), Smart Recycle and Reward Bin plays an important role to enable time-saving and efficient beverage containers recycling process such as in stores and supermarkets. The machine is powered by solar energy and is capable of auto-recognition of container material to separates them accordingly. The reward system uses Smart Card system to overcome the inconvenience faced by manual reward redemption as well as to save on paper usage. The microcontroller with the integration of sensors and mechanisms enable effective recognition and automatic separation of recycled items. After the sensor defferentiates the material, it will send the information to the microcontroller and the separation part will start working. The separation part involves 3 servo motors and 4 holes for reject item, tin container, plastic container, and glass container. Besides that, the microcontroller also performs auto-summation and stores the total of reward points into the smart card.

Mohd Helmy Abd Wahab, Aeslina Abdul Kadir, Mohd Razali Tomari and Mohamad Hairol Jabbar (2014), In this paper, proposed a smart recycle bin application based on information in the smart card to automatically calculate the weight of waste and convert the weight into point then store it into the card. The wastes are tracked by smart bins using a RFID-based system integrating the web-based information system at the host server.

M. Aazam, M. St-Hilaire, C. -H. Lung and I. Lambadaris (2016), This paper is proposed a cloud-based smart waste management mechanism in which the waste bins are equipped with sensors, capable of notifying their waste level status and upload the status to the cloud.

Aderemi A. Atayero, Segun I. Popoola, Rotimi Williams, Joke A. Badejo and Sanjay Misra (2019), Indiscriminate disposal of solid waste is a major issue in urban centers of most developing countries, and it poses a serious threat to healthy living of the citizens. Access to reliable data on the state of solid waste at different lo-cations within the city will help both the local authorities and the citizens to effectively manage the menace. In this paper, an intelligent solid waste monitor-ing system is developed using Internet of Things (IoT) and cloud computing technologies.

Na Jong Shen, Azham Hussain and Yuhanis Yusof (2022),This system is developed to perform the connectivity of mobile application with Internet of Things (IoT) based dustbins. These dustbins are developed using IoT. IoT is the system of physical devices implanted with software, sensors and network connectivity which empowers these items to gather and trade information.

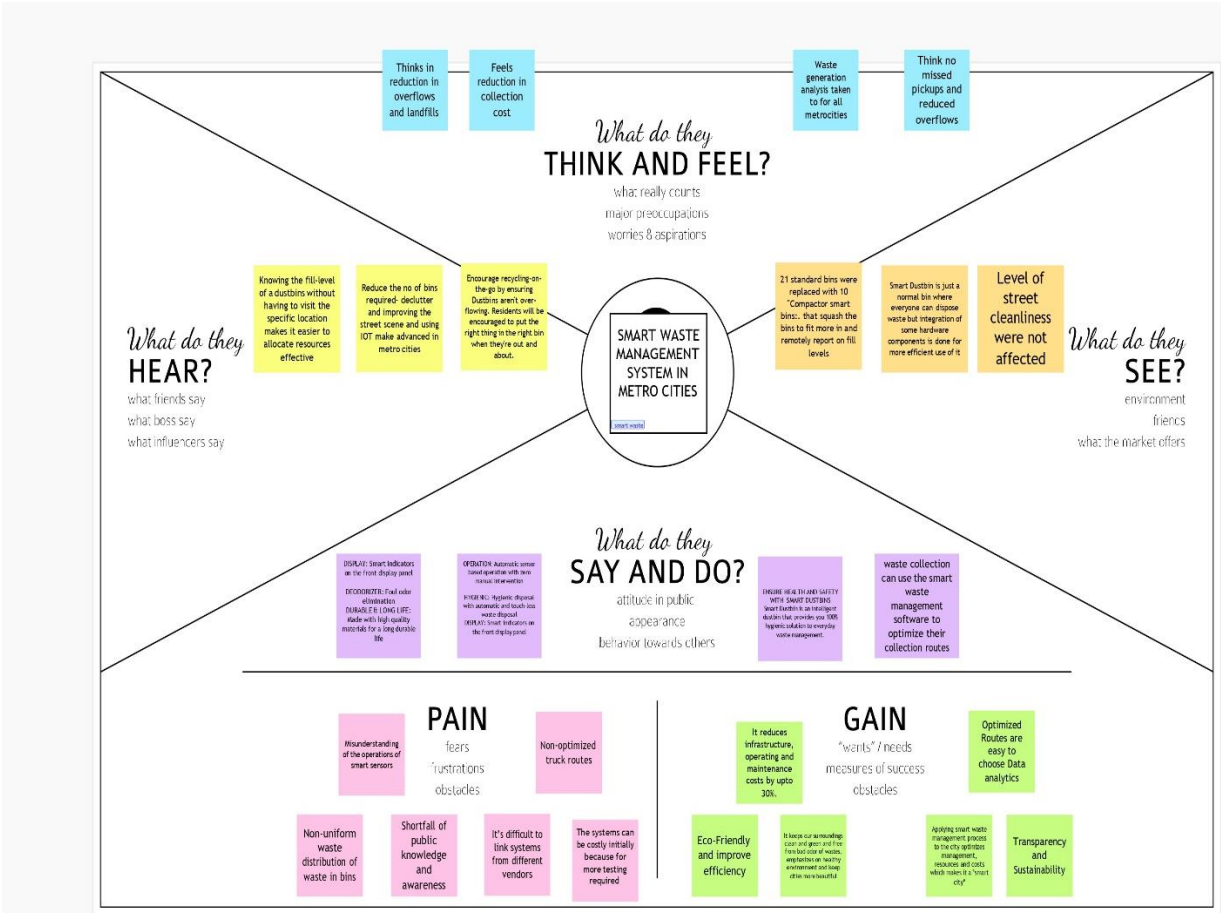
2.3 PROBLEM STATEMENT DEFINITION

Problem statement	I am (customer)	I am trying to	But	Because	Which makes me feel
PS-1	Municipal corporation authority	Get notified when the trash cans are full and be made aware of wherethe full cans are located	Don't havethe facilities atthe moment	There is no tool available to determine the level of bins.	Frustrated

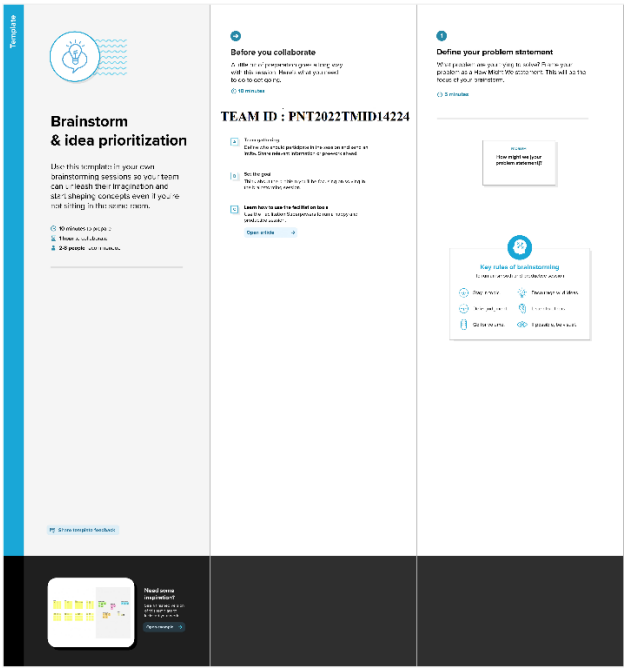
PS-2	Individual working for a private limited corporation	Get rid of the example of a surplus of waste	The trash cans are always filled	I occupy a metropolitan where there is acity is invariably crowd.	Worried

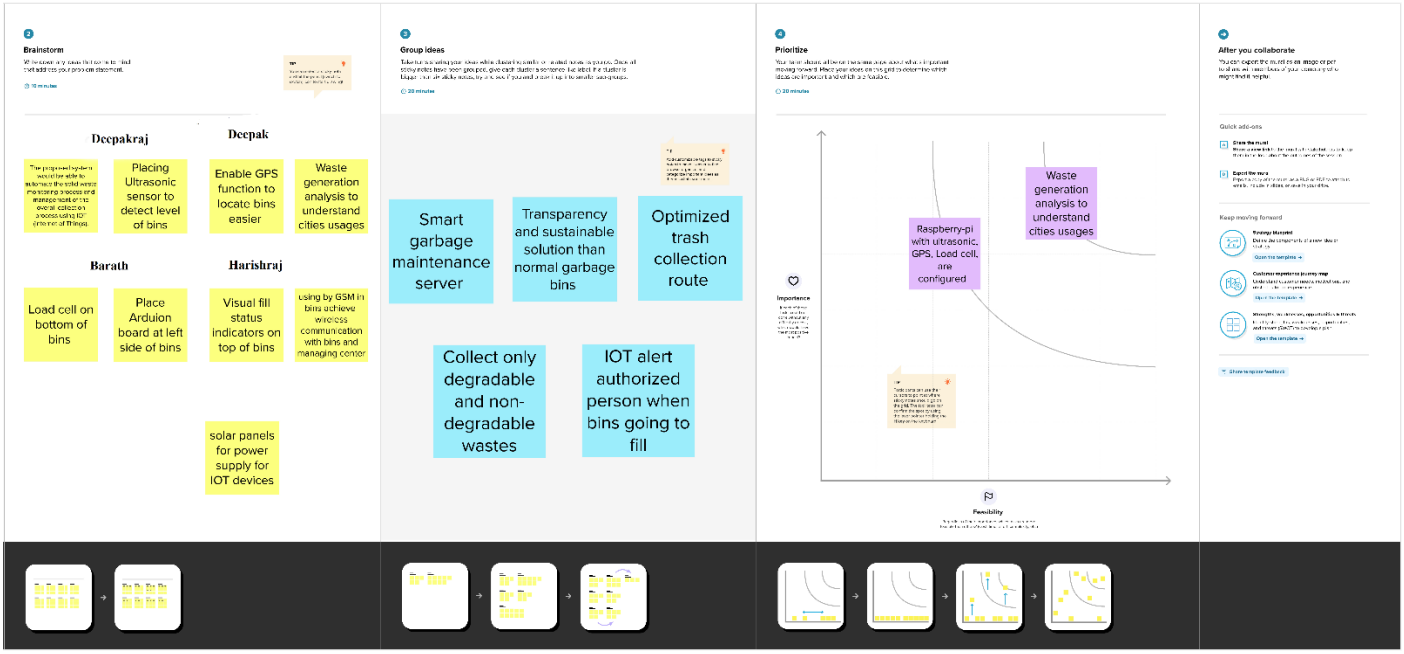
3.Ideation and proposed solution

3.1 Empathy map canvas


Thinks in reduction in overflows and landfills
Feels reduction in collection cost
Waste generation analysis taken to for all metrocities
Think no missed pickups and reduced overflows
What do they
THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
Knowing the fill-level of a dustbins without having to visit the specific location makes it easier to allocate resources effective
Reduce the no of bins required- declutter and improving the street scene and using IOT make advanced in metro cities
Encourage recycling-on-the-go by ensuring Dustbins aren't over-flowing. Residents will be encouraged to put the right thing in the right bin when they're out and about.
21 standard bins were replaced with 10 "Compactor smart bins:. that squash the bins to fit more in and remotely report on fill levels
Smart Dustbin is just a normal bin where everyone can dispose waste but integration of some hardware components is done for more efficient use of it
Level of street cleanliness were not affected
SMART WASTE MANAGEMENT SYSTEM IN METRO CITIES
smart waste
What do they
HEAR?
what friends say
what boss say
what influencers say
What do they
SEE?
environment
friends
what the market offers
What do they
SAY AND DO?
attitude in public
appearance
behavior towards others
DISPLAY: Smart indicators on the front display panel
DEODORIZER: Fool odor elimination
DURABLE & LONG LIFE: Made with high-quality materials for a long durable life
OPERATION: Automatic sensor based operation with zero manual intervention
HYGIENIC: Hygienic disposal with automatic and touch less waste disposal
DISPLAY: Smart indicators on the front display panel
ENSURE HEALTH AND SAFETY WITH SMART DUSTBINS Smart Dustbin is an intelligent dustbin that provides you 100% hygienic solution to everyday waste management.
waste collection can use the smart waste management software to optimize their collection routes
PAIN
fears
frustrations
obstacles
Misunderstanding of the operations of smart sensors
Non-optimized truck routes
Non-uniform waste distribution of waste in bins
Shortfall of public knowledge and awareness
It's difficult to tink systems from different vendors
The systems can be costly initially because for more testing required
GAIN
"wants" / needs
measures of success
obstacles
It reduces infrastructure, operating and maintenance costs by upto 30%.
Optimized Routes are easy to choose Data analytics
Eco-Friendly and improve efficiency
It keeps our surroundings clean and green and free from bad ooze of waste, emphasizes on healthy environment and keep cities more beautiful
Applying smart waste management process to the city optimizes management, resources and costs which makes it a "smart city"
Transparency and Sustainability

3.2 Ideation and BrainStorming





3.3 Proposed Solution

Si.No	Parameter	Description

1.	Problem Statement (Problem to resolved)	• The manual monitoring of wastes in trash cans is a laborious operation that requires additional time, money, and human labor • Unsafe trash disposal is generating problems for people. • Bad odor all around the place from uncollected trash or rubbish.
2.	Idea / Solution description	The key research objectives are as follows: • The proposed system would be able to automate the solid waste monitoring process and management of the overall collection process using IOT (Internet of Things). • The Proposed system consists of main subsystems namely Smart Trash

		System(STS) and Smart Monitoring and Controlling Hut(SMCH). • In the proposed system, whenever the waste bin gets filled this is acknowledged by placing the circuit at the waste bin, which transmits it to the receiver at the desired place in the area or spot. • In the proposed system, the received signal indicates the waste bin status at the monitoring and controlling system
3.	Novelty / Uniquenes	In contrast to the traditional ways for collecting trash cans, this strategy instructs us to utilize the transportationonly when necessary. Keeping an eye on the trash cans easier and less labor-intensive for humans

4.	Social Impact / Customer Satisfaction	From the public perception as worst impacts of present solid waste disposal practices are seen direct social impacts such as neighbourhood of landfills to communities, breeding of pests and loss in property value
5.	Business Model (Revenue Model)	By cutting back on unneeded transportation costs to pointless locations, this lowers a significantamount of fuel costs for city businesses. This initiative intends to assistmunicipal corporation. Provide a sanitary atmosphere.

3.4 Problem solution Fit

4.Requirment Analysis

4.1 Functional Requirment

Following are functional requirements for proposed solution

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR 1	Detailed bin inventory.	All monitored bins and stands can be seen on the map, and you can visit them at any time via the Street View feature from Google. Bins orstands

		are visible on the map as green, orange or red circles. You can see bin details in the Dashboard – capacity, waste type, last measurement, GPS location and collection schedule or pick recognition.
FR 2	Real time bin monitoring.	The Dashboard displays real-time data on fill-levels of bins monitored by smart sensors. In addition to the % of fill-level, based on the historical data, the tool predicts when the bin will become full, one of the functionalities that are not included even in the best waste management software.. Sensorsrecognize picks as well; so you can check when the bin was last collected. With real-time data and predictions, you can eliminate the overflowing bins and stop collecting half-empty ones.
Fr 3	Expensive bins.	We help you identify bins that drive up your collection costs. The tool

		calculates a rating for each bin in terms of collection costs. The tool considers the average distance depo-bindischarge in the area. The tool assigns bin a rating (1-10) and calculates distance from depo-bin discharge.
Fr 4	Adjust bin distribution.	Ensure the most optimal distribution of bins. Identify areas with either dense or sparse bin distribution. Make sure all trash types are represented within a stand. Based on the historical data, you can adjust bin capacity or location where necessary.

Non-Functional requirements

Following are non functional requirements for proposed solution

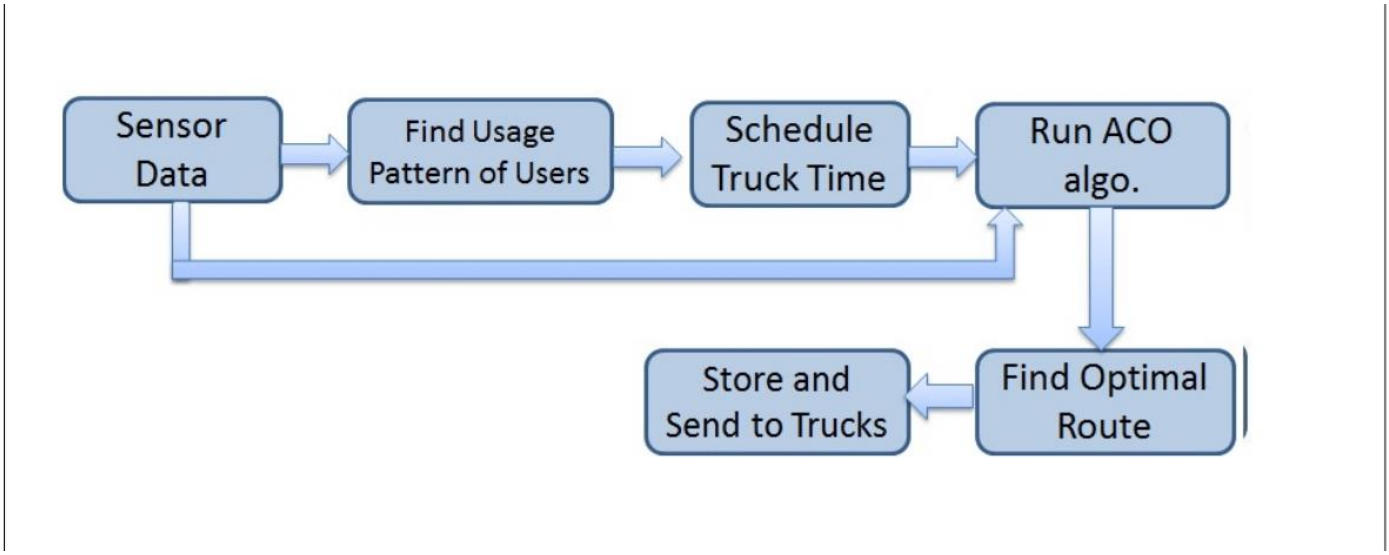
NFR No	Non Functional Requirment	Description
NFR-1	Usability	IoT device verifies that usability is a special and important perspective to analyze user requirements, which can

		further improve the design quality. In the design process with user experience as the core, the analysis of users' product usability can indeed help designers better understand users' potential needs in waste management, behavior and experience.
NFR 2	Security	Use a reusable bottles Use reusable grocery bags Purchase wisely and recycle Avoid single use food and drink containers
NFR 3	Reliability	Smart waste management is also about creating better working conditions for waste collectors and drivers. Instead of driving the same collection routes and servicing empty bins, waste collectors will spend their time more efficiently, taking care of bins that need servicing.
NFR 4	Performance	The Smart Sensors use ultrasound technology to measure the fill levels (along with other data) in bins several times a day. Using a variety of IoT networks ((NB-IoT,GPRS), the sensors send the data to Sensoneo's Smart Waste Management Software System, a powerful cloud-based platform, for

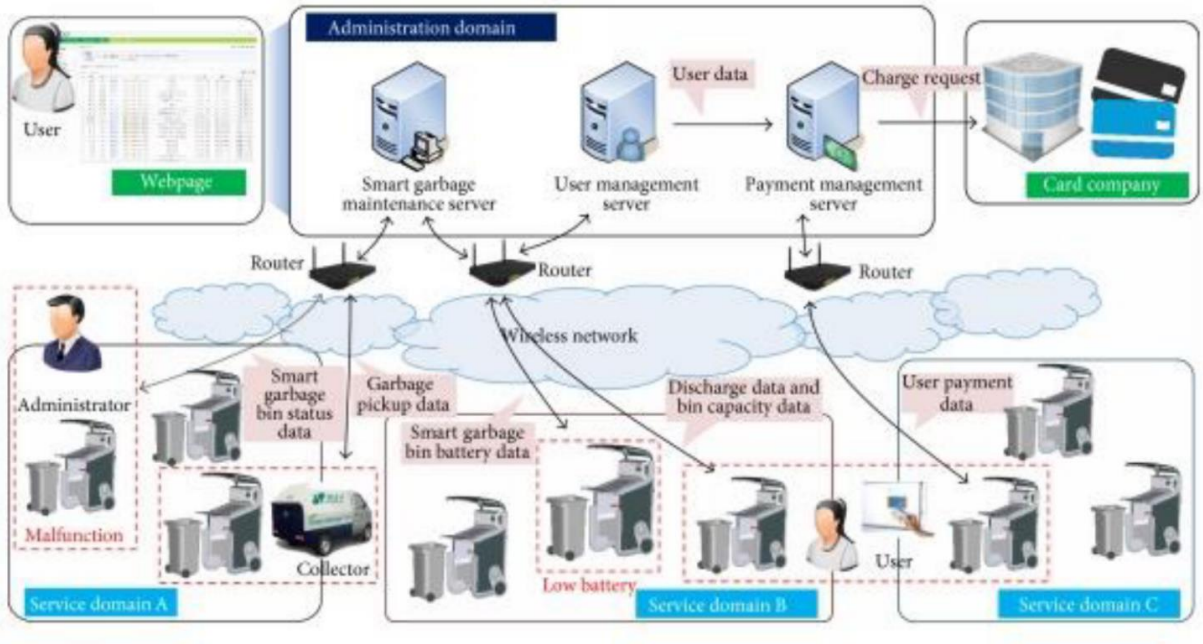
		datadriven daily operations, available also as a waste management app.
NFR 5	Availability	By developing & deploying resilient hardware and beautiful software we empower cities, businesses, and countries to manage waste smarter.
NFR 6	Scalability	Using smart waste bins reduce the number of bins inside town , cities coz we able to monitor the garbage 24/7 more cost effect and scalability when we moves to smarter.

5.Project Design

5.1 Data Flow Diagram



5.2 Solution & Technical Architecture



Components and Technologies

Table-1: Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Mobile Application	HTML, CSS, JavaScript.
2.	Application Logic	Logic for a process in the application	Java
3.	Database	Data Type, Configurations etc.	MySQL
4.	Cloud Database	Database Service on Cloud	IBM Cloud
5.	File Storage	File storage requirements	Local Filesystem and IBM cloud
6.	Infrastructure (Server / Cloud)	Application Deployment on Cloud Local Server Configuration	Local and Cloud Foundry

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	GitHub	Internet hosting service
2.	Security Implementations	Application security: Veracode Firewall: cisco	Network automation
3.	Scalable Architecture	It provides the room for expansion more database of smart bins added additionally can be updated.	Cloud storage
4.	Availability	As the system control is connected to web server it is available 24*7 and can be accessed whenever needed.	Server
5.	Performance	Performance is high it uses 5mb caches	Wireless Sensor Network

5.3 User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Admin	Login	USN-1	As an administrator, I assigned user names and passwords to each employee and managed them.	I can control my online account and dashboard.	Medium	Sprint-1
Co-Admin	Login	USN-2	As a Co-Admin, I'll control the waste level monitor. If a garbage filling alert occurs, I will notify the trash truck of the location and rubbish ID.	I can handle the waste collection.	High	Sprint-1
Truck Driver	Login	USN-3	As a Truck Driver, I'll follow Co Admin'sinstruction to reach the filled garbage.	I can take the shortest path to reach the waste filled route specified.	Medium	Sprint-2
Local Garbage Collector	Login	USN-4	As a Local Garbage Collector, I'll gather all the waste from the garbage, load it onto a garbage truck, and deliver it to Landfills	I can collect the trach, pullit to the truck, and send it out.	Medium	Sprint-3
Municipali tyofficer	Login	USN-5	As a Municipality officer, I'll make sure everything is proceeding as planned andwithout any problems.	All of these processes are under my control.	High	Sprint-4

6.Project planning and Scheduling

6.1 Sprint Planning and Estimation

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers,research publications etc.	30 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	30 SEPTEMBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	30 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	25 SEPTEMBER 2022
Problem Solution Fit	Prepare problem - solution fit document.	28 SEPTEMBER 2022
Solution Architecture	Prepare solution architecture document.	30 SEPTEMBER 2022

Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	08 OCTOBER 2022
Functional Requirement	Prepare the functional requirement document.	11 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	14 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram.	16 OCTOBER 2022
Prepare Milestone & ActivityList	Prepare the milestones & activity list of the project.	24 OCTOBER 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.	IN PROGRESS..

6.2 Sprint Delivery Schedule

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Objective	USN-1	The smart bin system will alert the nearby garbage collectors when the bin overflows.	6	High	DEEPAKRA J D V
Sprint-1	Registration	USN-2	The user(garbage collectors) can register for the application using the respective credentials provided to them.	4	Medium	DEEPAKRA J D V
Sprint-1	Designing	USN-3	Designing a circuit with sensors and arduino interface	6	High	DEEPAKRA J D V
Sprint-1	Cloud	USN-4	As an administrator, register in IBM cloud	4	Medium	DEEPAKRA J D V
Sprint-2	Code development	USN-5	Develop a code to send a message when the bin overflows using ultrasonic sensor	10	High	DEEPAK K

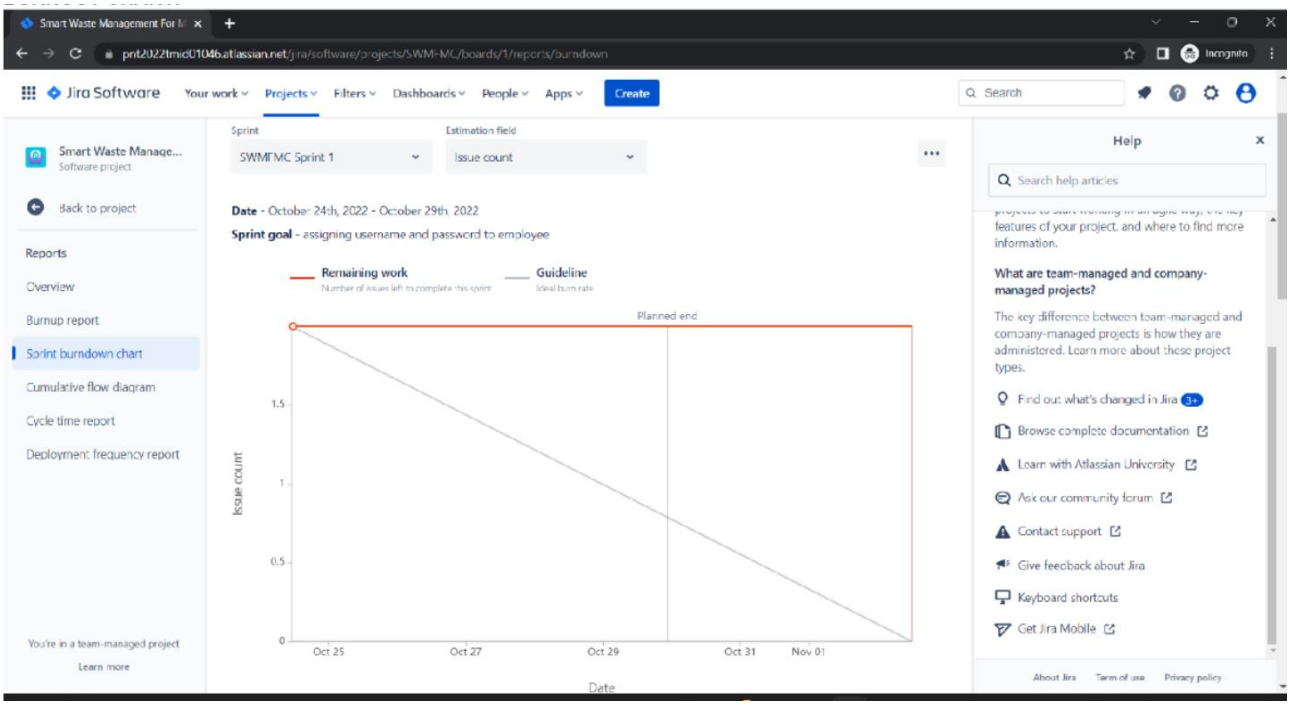
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Cloud Server	USN-6	Cloud web server is created which connects the bin and the authority who is responsible for the disposal of waste from its bin	10	High	Deepak raj
Sprint-3	Sensor	USN-7	Detect the level of garbage using sensor and store it in the server for specific interval of time.	10	High	Deepak
Sprint-3	Cloud	USN-8	Authority should allocate which garbage collector should collect the waste at particular area	10	High	Harishraj
Sprint-4	Communicating Medium	USN - 9	Garbage collector receives the message from the authority and goes to collect the garbage	10	High	Barath
Sprint-4	Communicating Medium	USN-10	Once the garbage is collected the particular person should intimate the completion of the task	5	Medium	Deepakraj
Sprint -4	Cloud database	USN-11	Update the database after task completion	5	Medium	Barath

Project Tracker, Velocity & Burndown Chart: (4 Marks)

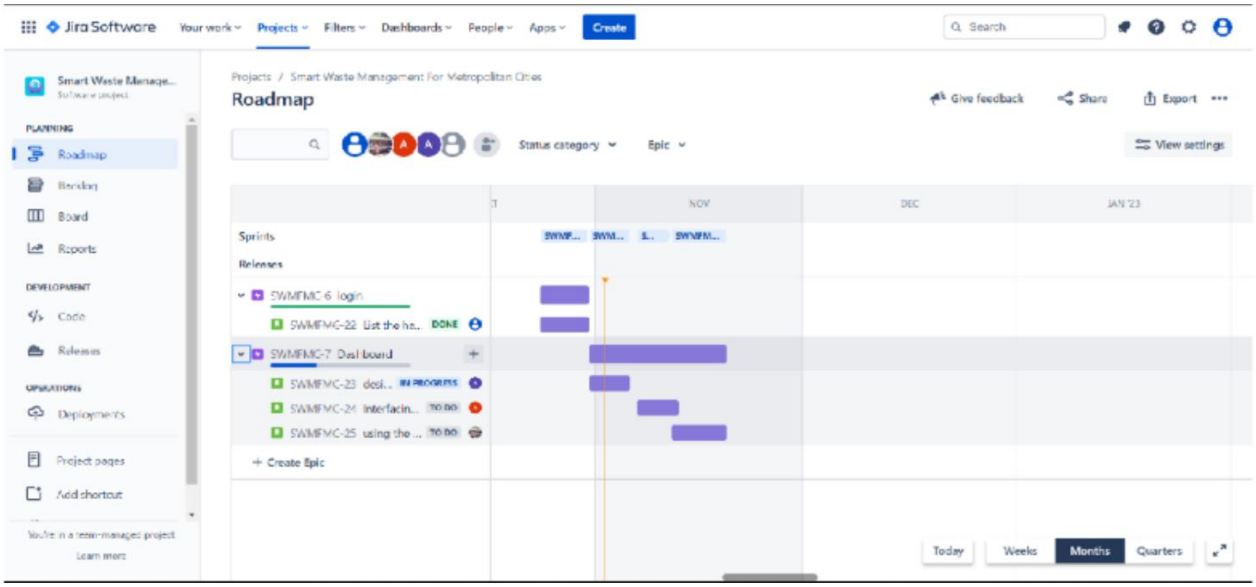
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	30 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 reports from JIRA

Burn Out Chart:

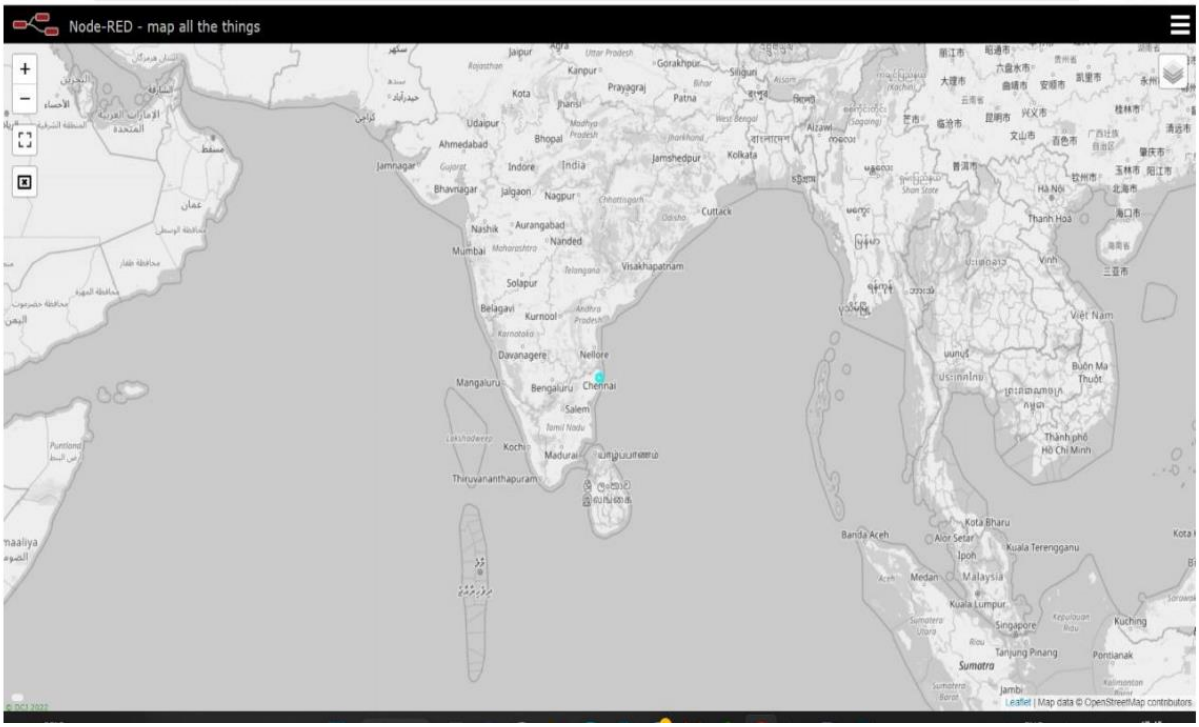


Road MAP:

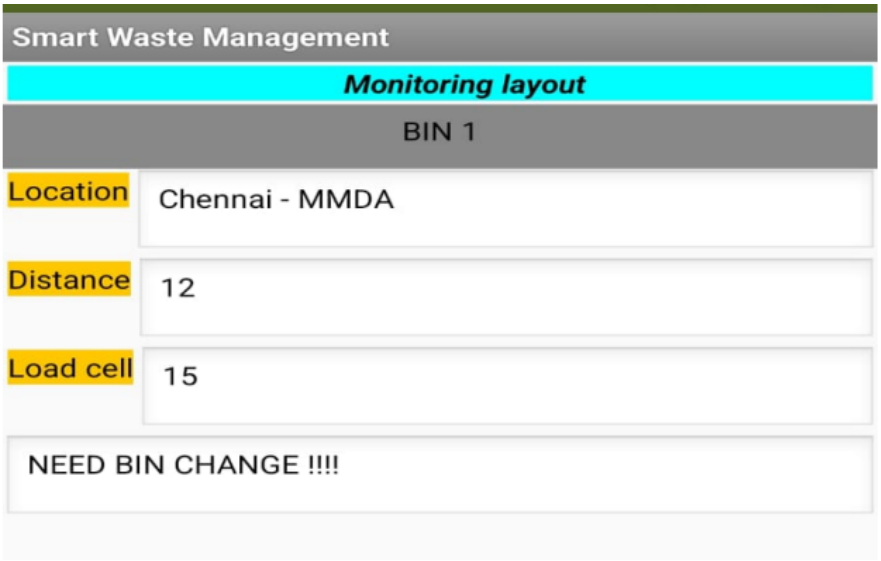


7.CODING AND SOLUTIONING

7.1 Feature 1-Location Tracker

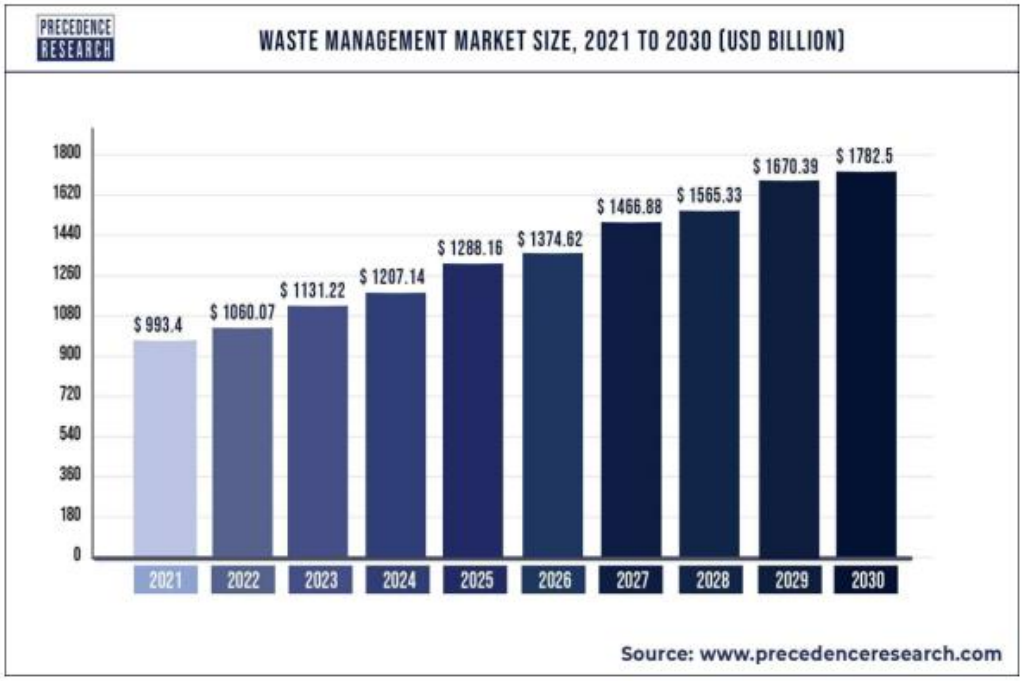


Feature 2:Live updation on collection Data



8.RESULTS

8.1 Performane Metrices



9. ADVANTAGES & DISADVANTAGES:

ADVANTAGES:

- Reduction in Collection Cost
- No Missed Pickups

• Reduced Overflows

• Waste Generation Analysis

• CO_2 Emission Reduction

DISADVANTAGES:

• System requires a greater number of waste bins for separate waste collection as per population in the city.

• This results into high initial cost due to expensive smart dustbins compare to other methods.

• Sensor nodes used in the dustbins have limited memory size

10.CONCLUSION

A Smart Waste Management system that is more effective than the one in use now is achievable by using sensors to monitor the filling of bins. Our conception of a "smart waste management system" focuses on monitoring waste management, offering intelligent technology for waste systems, eliminating human intervention, minimizing human time and effort, and producing a healthy and trash-free environment. The suggested approach can be implemented in smart cities where residents have busy schedules that provide little time for garbage management. If desired, the bins might be put into place in a metropolis where a sizable container would be able to hold enough solid trash for a single unit. The price might be high.

11 FUTURE SCOPE

There are several future works and improvements for the proposed system, including the following:

1. Change the system of user authentication and atomic lock of bins, which would aid in protecting the bin from damage or theft.

2. The concept of green points would encourage the involvement of residents or end users, making the idea successful and aiding in the achievement of collaborative waste management efforts, thus fulfilling the idea of Swachh Bharath.

3. Having case study or data analytics on the type and times waste is collected on different days or seasons, making bin filling predictable and removing the reliance on electronic components, and fixing the coordinates.

4. Improving the Server's and Android's graphical interfaces

12.APPENDIX

Source code:

```
#include <WiFi.h>                       // library for wifi
#include <PubSubClient.h>               // library for
MQTT #include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);

//.....credentials of IBM Accounts_____-

#define ORG "9v7njv"                    // IBM organisation id
#define DEVICE_TYPE "123"               // Device type mentioned in ibm watson iot platform
#define DEVICE_ID "1234567"             // Device ID mentioned in ibm watson iot platform
#define TOKEN "12345678"                // Token

//.....customise above values.....-.....

char server[] = ORG
".messaging.internetofthings.ibmcloud.com";       // server
namechar publishTopic[] = "iot-2/evt/data/fmt/json";
char topic[] = "iot-2/cmd/led/fmt/String";          // cmd Represent type and command is test format
of strings
char authMethod[] = "use-token-auth";               // authentication
methodchar token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//Client id

//.....

WiFiClient wifiClient;                              // creating instance
for wificlient PubSubClient client(server, 1883, wifiClient);

#define ECHO_PIN 12
#define
TRIG_PIN
13 float dist;

void setup()
{
```

```
 Serial.begin(115200);
 pinMode(LED_BUILTIN,
 OUTPUT);
 pinMode(TRIG_PIN,
 OUTPUT);
 pinMode(ECHO_PIN,
 INPUT);
 //pir pin
 pinMode(4,
 INPUT);

 //ledpins
 pinMode(23,
 OUTPUT);
 pinMode(2,
 OUTPUT);
 pinMode(4,
 OUTPUT);
 pinMode(15,
 OUTPUT);


 lcd.init();
 lcd.backligh
 t();
 lcd.setCurso
 r(1, 0);
 lcd.print("");

 wifiConnect(
 );
 mqttConnect(
 );
}

float readcmCM()
{
 digitalWrite(TRIG_PIN,
 LOW);
 delayMicroseconds(2);
 digitalWrite(TRIG_PIN,
 HIGH);
 delayMicroseconds(10);
 digitalWrite(TRIG_PIN,
 LOW);
 int duration =
 pulseIn(ECHO_PIN, HIGH);
 return duration * 0.034 / 2;
}
```

```
void loop()
 {

 lcd.clear();
 publishData();
 delay(500);
 if (!client.loop())
  {
   mqttConnect();                                  // function call to connect to IBM
  }
}

/*-----------------------------------------retrieving to cloud-----------------------------------*/

void wifiConnect()
{
 Serial.pri
 nt("Conn
 ecting to
 ");
 Serial.pri
 nt("Wifi"
 );
 WiFi.begi
 n("Wokw
 i-
 GUEST",
 "", 6);
 while (WiFi.status() != WL_CONNECTED)
  {
   delay(500);
   Serial.print(".");

  }
 Serial.print("WiFi connected, IP address: ");
 Serial.println(WiFi.localIP());
}
void mqttConnect()
 {
  if (!client.connected())
   {
    Serial.print("Reconnecting MQTT client to ");
    Serial.println(server);
    while (!client.connect(clientId, authMethod, token))
     {
      Serial.print(“”);
      delay(500)
      ;
     }
```

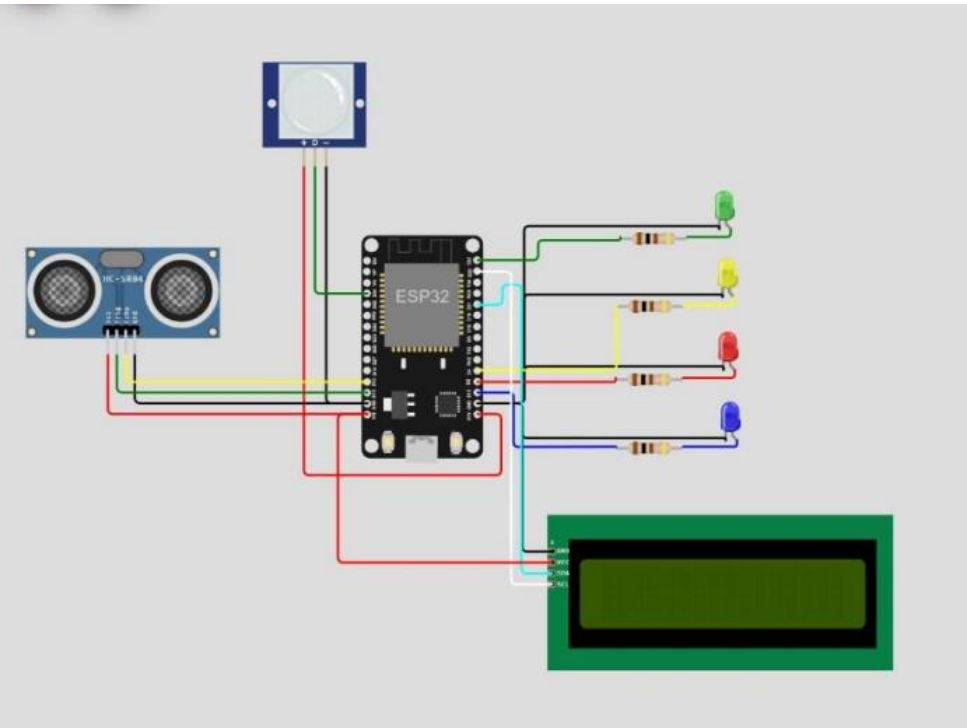
```
    initManagedDevice();
    Serial.println();
   }
 }
void initManagedDevice()
 {
  if (client.subscribe(topic))
   {
    Serial.println("IBM subscribe to cmd OK");
   }
  else
   {

    Serial.println("subscribe to cmd FAILED");

   }
 }
void publishData()
{
 float cm = readcmCM();

 if(digitalRead(34))                              //PIR motion detection
 {
  Serial.println(
  "Motion
  Detected");
  Serial.println(
  "Lid
  Opened");
  digitalWrite(1
  5,HIGH);

 }
 else
 {
  digitalWrite(15, LOW);
 }

if(digitalRead(34)== true)
{
 if(cm <= 100)                                    //Bin level detection
 {
  digitalWrite(2, HIGH);
  Serial.println("High Alert!!!,Trash bin is about to be full");
  Seria
  l.print
  ln("Li
  d          Closed");lcd.print("Full!
  Don't          use");delay(2000); lcd.clear(); digitalWrite(4, LOW);
  digitalWrite(23
  , LOW);
```

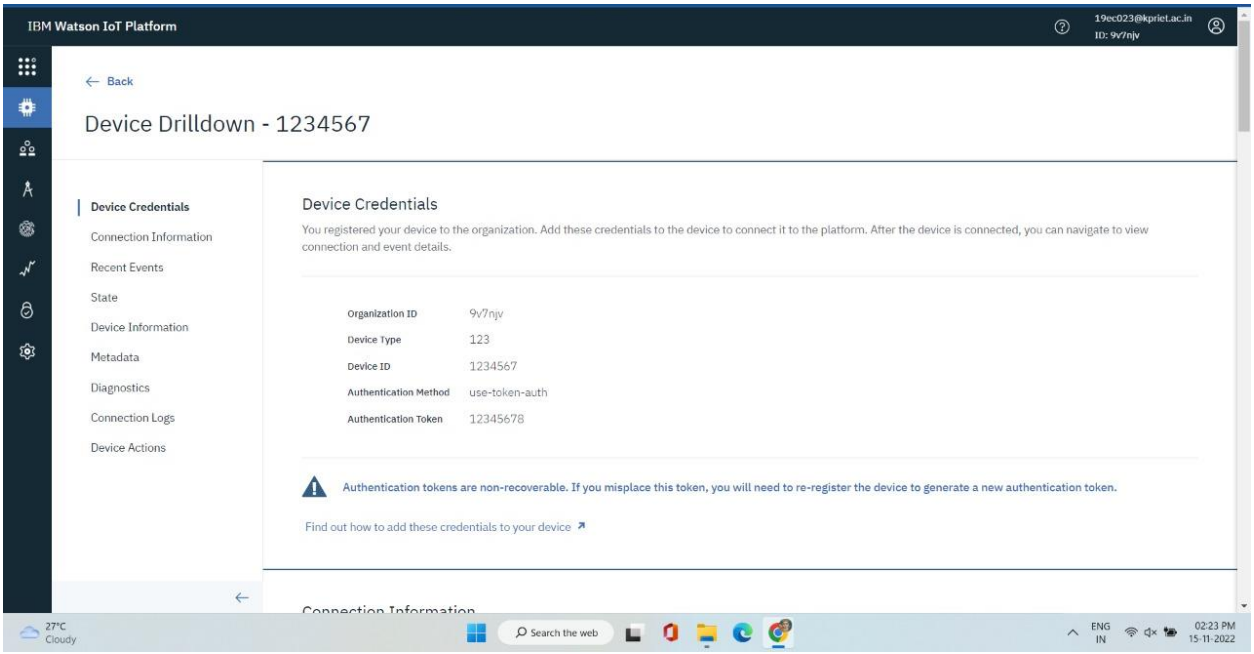
```
 }
 else if(cm > 150 && cm < 250)
 {
  digitalWrite(4,  HIGH);
  Serial.println("Warning!!,Trash is about to cross
  50% of bin level");
  digitalWrite(2, LOW);
  digitalWrite(23, LOW);
 }
 else if(cm > 250 && cm <=400)
 {
  dig
  ital
  Wr
  ite(
  23,
  HI
  GH
  );
  Serial.pr
  intln("Bi
  n is
  availabl
  e");
  digitalWrite(2,LOW)
  ;
  digi
  tal
  Wr
  ite(
  4,
  LO
  W)
  ;
 }
  delay(10000);
  Serial.println("Lid Closed");

}
else
{
 Serial.println("No motion detected");
}



 if(cm <= 100)
{
digitalWrite(21,HIGH);
String
```

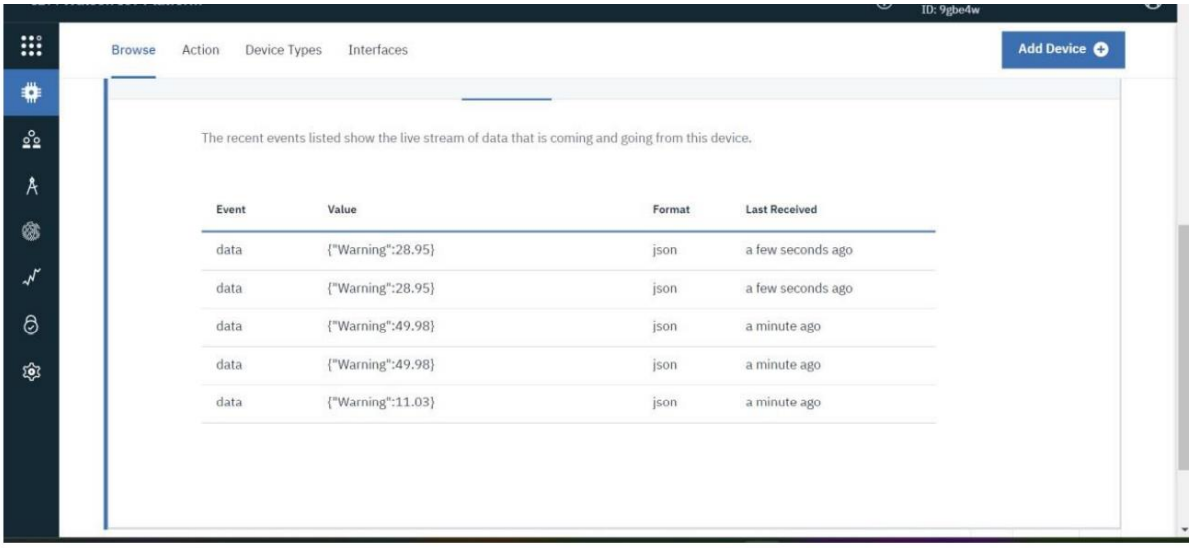
```
payload =
"{\"High
Alert!!\":\
"";
payload
+= cm;
payload
+= "left\"
}";
Serial.pri
nt("\n");
Serial.pri
nt("Sendi
ng
payload:
");
Serial.pri
ntln(payl
oa d);


if (client.publish(publishTopic, (char*) payload.c_str())) // if data is uploaded to
cloudsuccessfully,prints publish ok or prints publish failed
{
Serial.println("Publish OK");
}
}
if(cm <= 250)
{
digitalWrite(22,HIGH);
String
payload
=
"{\"Warn
ing!!\":\"
";
payload
+= dist;
payload
+=
"left\"
}";
Serial.pr
int("\n");
Serial.pr
int("Send
ing
```

```
distance:
");
Serial.pr
intln(cm)
;
if(client.publish(publishTopic, (char*) payload.c_str()))
{
Serial.println("Publish OK");
}
else
{
Serial.println("Publish FAILED");
}
}
float inches = (cm / 2.54);
 lcd.setCursor
 (0,0);
lcd.print("Inches");
lcd.setcursor(4.0);
lcd.setcursor(12,0);
lcd.print(“cm”);
lcd.setcursor(1,1);
lcd.print(inches,1);
lcd.setcursor(11,1);
lcd.print(cm,1);
lcd.setcursor(14,1);
delay(1000);
lcd.clear();
}
```

OUTPUT PICTURE:







GITHUB PROFILE:

https://github.com/IBM-EPBL/IBM-Project-9481-1659011193